Design Report

Architecture Overview

The application implements a three-tier architecture with React frontend, Node.js/Express backend, and MySQL database, all containerized using Docker for consistent deployment.

Presentation:https://www.loom.com/share/3e5e686232e4426c8eef556f1d8c0cd6?sid=5e4dad56-cc69-4a81-912d-2797ea999805

Database Design

- **Users**: Authentication credentials, profile data, role (admin/regular)
- **Channels**: Programming topic channels with creator reference
- **Messages**: Questions posted in channels with content and optional images
- **Replies**: Self-referential structure enabling nested discussions
- **Ratings**: Record of user votes on messages and replies

Foreign key constraints ensure data integrity and simplify cascading deletions when parent records are removed.

Frontend Structure

- **Component-based organization**: Reusable UI elements grouped by function
- **Context API**: Manages authentication state throughout the application
- **React Router**: Handles client-side navigation between pages
- **Responsive design**: Bootstrap-based layout adaptive to different screen sizes

Key Features & Implementation

- **JWT Authentication**: Secure, stateless API authentication
- **Code formatting**: Triple backtick syntax with language-specific highlighting
- **Nested replies**: Unlimited depth with collapsible threads
- **File uploads**: Image attachments for messages and replies
- **Real-time updates**: State management ensuring UI reflects latest data

NPM Packages

Frontend:

- react-router-dom (routing)
- axios (API calls)
- react-bootstrap (UI components)
- react-syntax-highlighter (code formatting)
- react-icons (UI icons)
- date-fns (date formatting)

Backend:

- express (web server)
- mysql2 (database driver)
- bcrypt (password hashing)
- jsonwebtoken (authentication)
- multer (file uploads)
- express-validator (input validation)

This architecture balances functionality, security, and maintainability while adhering to modern web development practices and meeting all project requirements.